

LLNL Facility Embraces Environmentally Conscious Manufacturing Principles

excerpted from *Science & Technology Review*, May 1996

LLNL's Chemical and Electrochemical Processes Facility has earned a name for itself not only as a top metal-finishing center in the nation, but also for embracing environmentally conscious manufacturing principles. The facility, operated by the Metal Finishing Group of Mechanical Engineering's Manufacturing and Materials Engineering Division, uses chemical and electrochemical processes for wide-ranging assignments from LLNL research programs, other national laboratories, and international research agencies.

In its efforts to become more environmentally conscious, the facility has adopted scores of improvements including recycling strong acids, substituting Earth-friendlier materials, and eliminating cyanide in its operations. The operation's environmental efforts have been so successful that the facility has decreased its discharge of water to the Livermore sewer system from three million gallons to zero! Further, whereas in 1991, the facility was producing 60,000 gallons of chemical waste to be trucked off site, it now produces only 1,000 gallons of this waste annually.

These environmental changes have also produced sizable cost savings—more than \$500,000 per year. Many of the savings resulted from simple material substitutions: for example, costly chlorinated cleaning compounds were replaced with much cheaper, and more environmentally kind, materials. Standard degreasing equipment was replaced with a variety of aqueous cleaning processes, including soak and electrolytic cleaning and ultrasonic

cleaning in which high-frequency sound waves remove very fine particulates, and the residual water is recycled for another round of cleaning tasks. The recycled water has fewer metallic ions than does the water supplied to city residents.

The facility also installed diffusion dialysis equipment to clean the acid metal-finishing solutions (e.g., nitric, sulfuric, and hydrochloric acids) on a regular maintenance schedule to remove contaminants and impurities that reduce the efficiency of the solutions. Removal of contaminants allows for longer use of the metal-finishing solutions. Such maintenance has reduced the amount of acid metal-finishing solutions disposed of as hazardous waste by the facility.

Much of the effort to adopt more environmentally friendly procedures and materials has centered on cyanide. Over the past several years, LLNL has found substitutes for almost every process involving cyanide. For example, copper cyanide plating was replaced with a copper pyrophosphate process, which works quite well and produces parts as good as those obtained with the copper cyanide process.

The advances made by the Chemical and Electrochemical Processes Facility are part of the larger, Laboratory-wide effort to encourage pollution-prevention and waste-minimization activities.

For further information, contact Jack Dini at 2-8342 or Chris Steffani at 3-1780.

Revised WAC Now Available

The Waste Acceptance Criteria (WAC) document has been revised and is currently being distributed to all LLNL generators of hazardous waste. The revised document includes forms that have been modified in the last year and an update of the combined list of chemicals, EPA codes, and federal and state characteristics.

If you would like a copy of the WAC and have not received one, please contact Gloria Campbell by phone at (510) 423-8825 or by e-mail at campbell10@llnl.gov.

What's Ahead in the HWM Division

by Dan Hoyt



*Interview with
Dick Crawford
Deputy Division Leader
Hazardous Waste
Management Division*

The Hazardous Waste Management (HWM) Division has been investigating, evaluating, and implementing several new projects for improving business operations. Two of these projects—the 90-Day Pilot Project and the Legacy Waste Program—will help reduce operating costs and provide for improved services to waste generators.

90-Day Pilot Project

This project began in 1996 and will be expanded in 1997. It streamlines the waste management process to allow shipment of hazardous waste to off-site treatment and disposal facilities within 90 days of leaving the workplace. This could eliminate many of our permitted storage areas and their complex (and expensive) regulations. To help accomplish this, an improved information system is needed to speed information collection and retrieval.

We have designed such a system, and it includes a portable, wireless link between field staff and computer resources. Laptop computers equipped with radio frequency modems allow access to the Internet and to servers from anywhere on site (in particular, the waste accumulation areas), except high-security areas.

Following are some of the information tools planned for this online system. For bulk waste (≥ 5 -gallon containers), a waste evaluation form (WEF) will be created for each waste stream to describe the

information needed to manage the waste all the way to disposal. Once the WEF is entered into our central database, (i.e., the Total Waste Management System or TWMS), most of the information needed for a waste disposal requisition (WDR) will be automatically provided. This will be linked to the planned electronic requisition (E-req), an Internet-based, menu-driven replacement for the WDR. In addition, a central database will contain online material safety data sheets (MSDS) as well as other safety and compatibility data.

These information enhancements are intended to make proper information available quickly to allow the safe and efficient movement of waste. They will reduce paperwork handling and data-entry errors, eliminate duplicate management checks, provide shipping labels and manifests, and expedite removal of waste from LLNL generators.

(For more information about the Information System, contact Donna Maloy at 2-0497.)

Legacy Waste Program

The Legacy Waste Program is responsible for managing approximately 2300 m³ (equivalent to 11,070 55-gallon drums) of radioactive and mixed radioactive waste that has accumulated on site since 1985.

This waste began to accumulate with changes in the definition of mixed waste in the 1980s and the changes in the waste-acceptance criteria at the Department of Energy's (DOE's) Nevada Test Site (NTS) that resulted in the temporary halting of shipments to the site in 1990. Additional waste has accumulated because DOE's Waste Isolation Pilot Program (WIPP) has not begun to accept transuranic (TRU) waste from LLNL. Further, HWM only treats aqueous waste, thus organic liquids and solid mixed wastes have also been accumulating.

Our goal is to treat and/or dispose of all legacy waste by 2006. To realize that goal, the following measures are being implemented by the Legacy Waste Program:

- Low-level waste is now certified for shipment to NTS. However, legacy waste must be characterized for disposal. The major method for doing this is real-time radiography (RTR) of containers, with manual examination of some fraction of each container. Disallowed materials (aerosol cans, liquids, lead bricks, hazardous chemicals, etc.) will have to be removed. Unfortunately, approximately 50 percent of the waste already radiographed shows some of this disallowed material.
- WIPP is expected to accept TRU waste beginning in November 1997 (LLNL TRU waste must undergo RTR and head-space gas sampling among other characterizations).



Chris Carlson, of HWM's Information Management Group, shows Field Technician Susan Laureta one of the new lap top computers.

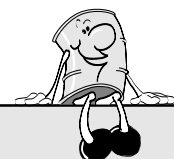
What's Ahead: Legacy Waste (continued)

- Commercial treatment of solid and liquid mixed wastes is being developed. We have already used an incinerator for oils and macro-encapsulation for lead-containing waste.
- New on-site mixed waste treatment systems have been or will be implemented. These include stabilization (physical or chemical processing to eliminate leaching of toxics), a bleaching process for stabilizing uranium fines, a debris washer, and a pressure vessel for treating reactivities.
- A permitted off-site disposal facility for mixed waste soils at Envirocare in Utah has been used by LLNL.

(For more information about the Legacy Waste Program, contact Rod Hollister at 2-4959.)

• Reduce • Reuse • Recycle

For more information, call EARTH Hotline: 3-2784



Material	Where to Recycle
Paper (laser and fax paper; ledger, computer, colored paper; LLNL directories; manila file folders)	WOW box (NO bound reports, newspaper, vellum, sticky notes, cardboard, paper towels, envelopes, non-LLNL phone books)
Telephone books	Send to B618
Newspapers	Bin outside B219 or B618
Printer toner cartridges	Send to B618 recycle bin/shipping area
Cardboard	Maroon bin
"Popcorn" packing	Send to B411 shipping area
Glossy, colored magazines	Mail Service B41 or B618
Eyeglasses	Send to Fred W. Allen or Medical Center Safety Glasses office

Getting the Lead Out of the Two-Stage Gas Gun

Replacing the lead piston in the two-stage light-gas gun with a copper piston limits exposure to lead and prevents creation of mixed waste when the target is radioactive material, reports Jim Crawford, the lead mechanical technician for physics in Building 341.

The gun previously employed a lead piston to compress hydrogen gas. The pressure from the compressed gas shoots a projectile at a target. In some experiments at LLNL, radioactive D38 is used as the target. Lead pistons generate mixed and hazardous waste by depositing small amounts of lead on projectiles from the gun. This lead can be transferred to D38, thus creating mixed (hazardous and radioactive) waste. Because copper is not a RCRA regulated metal, it does not generate a RCRA mixed waste when the projectile impacts a D38 target.

LLNL's two-stage gas-gun now uses a 15-pound copper piston to compress approximately 60 cubic feet of hydrogen gas to break a rupture valve and accelerate a projectile down the barrel to a muzzle velocity of as much as 8 km/s. The velocity of the high-pressure shock wave, combined with the initial conditions, yields a

precise measurement of the pressure, density, and energy attained.

The two-stage light-gas gun is used to perform equation-of-state (EOS) and shock-wave experiments and for research into the nature of materials. Metals, fluids, plastics, and even rocks may be target subjects. Pressures to millions of atmospheres, densities several times the solid density, and temperatures of thousands to millions of degrees can be produced. Even though these extreme conditions last only a millionth of a second or so, that is long enough to measure the properties of these materials.

The two-stage light-gas gun, built at LLNL by General Electric for ballistic missile studies, became operational in 1972. The EOS measurements it made were important in the weapons program, particularly to determine the properties of high explosives and to obtain fundamental information about detonation properties. Recent applications have greatly expanded the fields of interest.

(For more information on this subject, contact Jim Crawford at 2-9646.)

EP0006, "Hazardous Waste Generation & Certification"

January 1997

Thursday, January 9 1:15 to 4:30 p.m. (afternoon class)
Wednesday, January 22 8:15 a.m. to 12:00 noon

February 1997

Tuesday, February 4 8:15 a.m. to 12:00 noon
Wednesday, February 19 8:15 a.m. to 12:00 noon

(For more information or registration, contact Linda Lucchetti, EPD Training Coordinator, at 2-9236.)

EP0006-R, "Hazardous Waste Generation & Certification-Review"

January 1997

Tuesday, January 14 1:30 to 3:30 p.m. (afternoon class)
Thursday, January 16 10:00 a.m. to 12:00 noon
Thursday, January 23 10:00 a.m. to 12:00 noon
Tuesday, January 28 10:00 a.m. to 12:00 noon

February 1997

Tuesday, February 11 10:00 a.m. to 12:00 noon
Tuesday, February 11 1:30 to 3:30 p.m. (afternoon class)
Thursday, February 13 10:00 a.m. to 12:00 noon
Thursday, February 20 10:00 a.m. to 12:00 noon

(To enroll in this class, please send registration forms to the EPD Training Section, L-626. Because of the class format and the limit on number of participants, "walk-ins" are not encouraged. For more information, contact Linda Lucchetti at 2-9236.)



Environmental Protection Department
Hazardous Waste Management Division, L-620
Lawrence Livermore National Laboratory

WASTE MATTERS is published by the HWM Division to inform generators of the latest regulations in waste handling and management.

To receive this bulletin, call 2-6761. The publishing staff welcomes any questions, suggestions, or ideas for articles; please contact the managing editors listed below:

Publisher:

Dick Crawford

Managing Editors:

Dan Hoyt, 3-3575
Susan Laureta,
3-1996

Editor:

Karen L. Lew

Compositor:

Sharon Haera

Photographer:

Sandi Guntrum

Publication Services:

Brenda Staley

UCRL-AR-110229-96-3

Work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract W-7405-Eng-48.



Recycled